

October, 2003 Report of the Tevatron BPM Upgrade
wbs item 1.3.4.6.4
Stephen Wolbers, Bob Webber
V 1, November 8, 2003

Project Manager's Summary:

October was a month of increased effort on the Tevatron BPM Upgrade, now that the vacation period has ended and people have become available for work. One complication was the BTeV Temple Review, which did have an impact on some of the subprojects.

The major accomplishments in October include major progress on the BLM interface card design and first prototypes, first software and data format definitions for the front-ends, serious work on the electronics design, proposals for separating and measuring both the proton and anti-proton signals, major tunnel work for connecting both ends of the Tevatron BPM pickups, and serious work toward establishing a wbs for the project.

November will bring a dedicated effort to specify and design the core electronics for the BPM system. Other parts of the project will continue in parallel.

Resources Used in October, 2003:

The total number of FTE-months devoted to the project in calendar October 2003 in the Computing Division was reported to be 6.0 FTE-months, spread over a number of people. (2.1 FTE-months of the 6.0 was spent on Tevatron tunnel work.) This compares to 2.3 FTE-months in August and 4.1 FTE-months in September. This ramp-up reflects the continuing increase in effort devoted to the project as required. Estimated effort expended in the Beams Division was 5.4 FTE-months in October, 2003. (3.5 FTE-months of the 5.4 was spent on Tevatron tunnel work.) The total effort expended was 11.4 FTE-months.

Purchase requisitions were placed in October for the work in the tunnel and for the BLM interface card. The requisitions and amounts are as follows:

PO 553812	\$4,330	Connectors
PO 553679	\$1,002	Connectors
PO 545187	\$25,000	Electrician Services
Pro-Card	\$500	BLM prototype parts

Meetings held, Reports Given:

Meetings were held in October on the following dates:

October 1,6,8,13,15,16,20,22,29.

Many of the meetings were TeV BPM Upgrade Project meetings, namely:

October 1,8,15,22 and 29. Special meetings include:

October 6: Vince Pavlicek: "Make a BPM Out of a Damper?"

October 13 and 16: Rob Kutschke: "BPM Signal Processing, A Cartoon View"

October 20: Tom Shea, ORNL, "RHIC BPM's"

October 24: Stephen Wolbers, "Tevatron BPM Upgrade" status report to the Tevatron Department

Documents:

The following documents were written and added to the Beams Division Document Database in October:

Robert Kutschke, "TeV BPM Upgrade: Offline Software Status Report", Beams Document 866-v1, October 3, 2003.

Vince Pavlicek, "Make a BPM out of a Damper?", Beams Document 870-v1, October 7, 2003.

Jim Steimel, "Tevatron BPM Analog Filter Specifications", Beams Document 872-v1, October 8, 2003.

Mike Martens, "Bunch spacing and cogging for 36 bunch operations in the Tevatron", Beams Document 876-v1, October 16, 2003.

Robert Kutschke, "BPM Signal Processing: A Cartoon View", Beams Document 873-v2, October 20, 2003.

Brian Hendricks, Margaret Votava, Luciano Piccoli, Dehong Zhang, "Tevatron Beam Position Monitor Software Specifications", Beams Document 860-v4, October 24, 2003.

Jim Steimel, "Tevatron Beam Position Monitor Upgrade Proton Signal Cancellation", Beams Document 884-v1, October 28, 2003.

Subproject Leader Reports:

Requirements: Mike Martens

The requirements for the Tevatron BPM upgrades have remained fairly stable over the past month and most of the focus has been on design of the electronics. The BPM requirements document was reviewed at the end of September and no major objections were noted. Many useful comments were made by the reviewers. Some thought about the requirements for software upgrades related to the BPM upgrade has begun and is in its preliminary stages.

There is one new issue with respect to the requirements which has been brought to our attention by Valeri Lebedev who has been investigating turn-by-turn (TBT) behavior of beam in the Tevatron and working with the beamline tuner (BLT) which also makes TBT measurements of the beam at injection. The new issue is related to the definition of bunch position when a TBT measurement is being made. The present version of the requirements document asks for the BPM TBT measurement to give the position of the bunch on a TBT basis. However, when the chromaticity in the Tevatron is not zero then it the head and the tail of the bunch will have different transverse positions and this could affect the BPM measurement system. The requirements document should be updated to ask that the BPM TBT measurement report the centroid of the bunch as averaged over the length of the bunch. Some work is still needed in order to translate the understanding of the physics of bunch motion into a requirement and then a specification for the design.

Specifications: Jim Steimel

We have completed the storage and organization of data taken on the BPMs at A1 prior to the shutdown. The data is public, and routines for extracting the data for analysis have been completed and tested. Some analysis of the data has been completed. A first draft of the outline for the specifications document has been completed. A draft of the software specifications has been completed (version 4). A draft document describing the process of measuring pbars in the presence of protons has been completed.

The goals for the month of November are to create two draft documents linking the requirements and specifications: one document to explain the details of the closed orbit position measurement process, and one document to explain the details of the turn-by-turn measurement process. We will also provide the necessary information and analysis required to realize what modifications will be necessary to some current damper systems in order to fulfill the Tevatron BPM requirements.

Electronics: Vince Pavlicek

During October, the electronics subproject members read documents and attended meetings as part of coming up to speed and gathering background material for the BPM

project. Considerable time was spent analyzing the applicability of existing hardware that could be used to satisfy the project. This is producing a short list of possible modules along with the advantages and disadvantages of each. A search of commercially available hardware was made to investigate whether a solution could be economically purchased.

The BLM interface portion of the project was defined and assigned to an engineer. Prototype hardware was purchased and the architecture and logic design was started.

Front-end/DAQ software: Margaret Votava

October was spent on continued discussions with the various accelerator departments (primarily Tevatron and Controls) in understanding the demands on the new data acquisition system. We have documented this accumulated knowledge (860) in a very rough format which is evolving into the specifications document. We analyzed the recycler BPM code to understand its behavior and how the code and/or ideas may be used for the tevatron BPMs. The answer to this will be revisited once the hardware architecture is selected.

Online software: Brian Hendricks

During the month of October, the primary work of the online software group involved the development of the ACNET device data structures which will be passed from the front end application programs. The draft version of these structures were documented in "Tevatron Beam Position Monitor Software Specifications", Beams Document 860. These structures appear to be fully defined pending comments about the inclusion of further machine metadata.

Offline software: Rob Kutschke

The offline software portion of this project, and its interfaces with other parts of the project, are currently poorly defined. Many aspects will become better defined with time, as other pieces of the project advance. In order to better learn the perspective of an end user, I have started to work on a project for Valeri Lebedev during which I will build a new console application which uses BPM data. I am evaluating the feasibility of building this application using the Sun/JAVA environment rather than the VAX/C environment. The goal is to have this project at an advanced state by the end of November.

I have also worked on understanding the data taken just before the shutdown from one Tevatron BPM using the main injector damper boards to process the signals. The goal of this project is to experiment with extracting antiproton positions in the presence of protons. I may have to pass this project on to someone else in order to accomplish the first project.